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AUTHOR Yanosko, Barbara J.
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Remedial or developmental mathematics classes are variantly assigned or elected by the students enrolled. The chief question is why are they there: ability, background, or anxiety; or a combination of causes? Who are these people? This paper explores these questions for an elective course taught through a junior college at a California state university and makes comparisons between this course and experiences at institutions in the southern United States and the midwestern United States. Students described in this paper took a mathematics class on the campus of a state university in northwestern California. Although not all were university students, the courses they took were an integral part of the mathematics training at that university. The courses were remedial or developmental in nature. Who takes these classes, why they take them, and how successful they were are the subjects for discussion. (Author/MP)

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THE WHO, HOW AND WHY OF THE DEVELOPMENTAL MATH STUDENT

by
Barbara J. Yanosko
Humboldt State University
Arcata, California

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ABSTRACT: Remedial/developmental math classes are variantly assigned or elected by the students enrolled. The chief question is why are they there: ability, background, or anxiety; a combination of causes? Who are these people. The paper will explore these questions for an elective course taught through a junior college at a California tate university and compare with experiences at institutions in the southern United States and midwest.

The students described in this paper have taken a math class on the campus of a state university in northwestern California. Although not all are University students, the courses they have taken are an integral part of the mathematics training at that university. The courses are remedial/developmental in nature. Who takes these classes, why they take them, and how successful they are are the subjects for discussion.

BACKGROUND

Humboldt State University is a school oriented toward natural resources with attendant emphasis on biological and physical sciences. Humanities, business, social sciences and physical education majors are also pursued, but a full 51.9% of the student body pursue natural science/resources related degrees. Although graduate degrees in mathematics are not offered, an undergraduate degree is. The entry level math course is a four-unit, one quarter intermediate algebra course titled Math D. Advancing up the line, the student

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can then take a business math series or a five-unit, one quarter advanced algebra/trigonometry class, then on to calculus. Most majors require the completion of at least Math D. It is possible to obtain a degree without math courses, but in practice the options are so severely limited most students do take at least one course.

Admittance to Math D is not automatic on enrollment. Each student is given a 60-item multiple choice math placement exam upon entrance. The test is divided into three parts: basic algebra, intermediate algebra, and advanced algebra/trigonometry. A score of 12 or better in Part I permits a student to enroll in Math D, and so on up to Calculus. If a student fails to score 12 on Part I, he/she cannot enroll in Math D. The student may take the test 3 times before he/she is required to do some remedial work.

Up until this year a student would have to successfully complete a basic algebra course at a local junior college in order to qualify for Math D. In fact, this practice was facilitated by the EOP/Special Services Program which made arrangements for the courses to be taught on the HSU campus by part-time instructors. The course taught was titled Math 150 and is a 5-unit, one quarter class in Basic Algebra. This year the Math Department at HSU decided to offer the basic algebra course under the title Math A, a 4-unit class. Students taking the Math 150 course could not transfer credit to HSU. Students taking Math A do not receive "math" credit but the grade is computed in the average.

Still there are people who could not keep up with the pace of Math 150 or Math A. For these students Math 150 is still taught on the HSU campus as a 2 quarter course; 3 units in Math 150X and 2 units in Math 150Y.

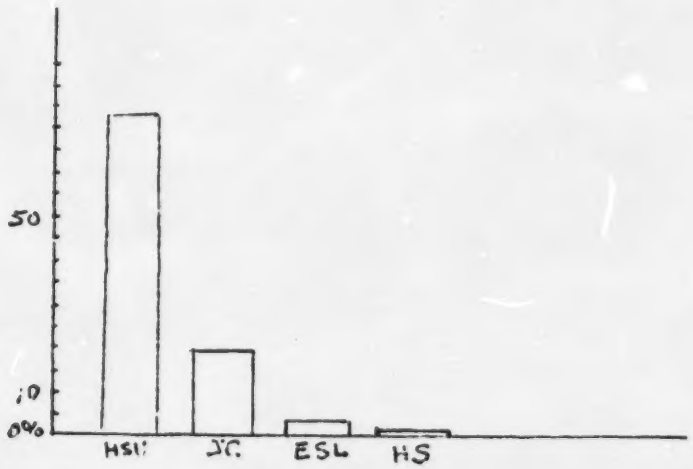
Successful completion of these courses permits a student to enroll in Math D.

Enrollment in the remedial/developmental class is based largely on exam results but also to some degree on choice, especially whether to enroll in a one- or two-quarter course. In this case there is a cooperation between several program elements within the university and an outside institution. The data reported is based on experiences with five Math 150 classes and two 150X and 150Y series (196 students).

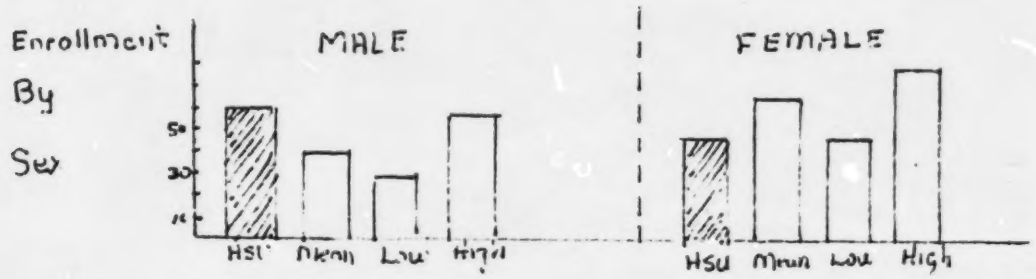
WHO ARE THE STUDENTS?

The students in Math 150, 150X and 150Y are not only HSU students but also foreign students enrolled in an English as a Second Language Program through the Office of Continuing Education (3%). High school students (1%) seeking to accelerate their math training also attend. Junior college students are also welcome, of course, and they comprise 21% of the population. This leaves 75% of the students who are university enrollees.

Enrollment By Institution

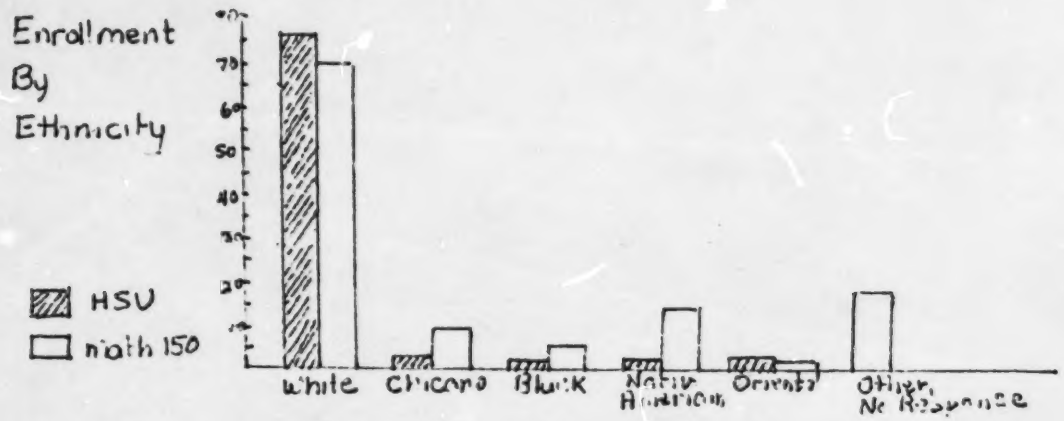


Sex Ratio. Of the eight classes considered overall 61% of the students were female and 39% were male. The ratio varied from a high ratio of 76% female - 24% male to one where 44% were female, 56% male. At HSU the expected ratio is 45% female and 55% male.



Age. Most of the students are in the 18-24 year age range of the typical college student. In these classes 8% were also from the 40+ category.

Ethnicity. The Math 150 courses at HSU were sponsored, as was mentioned, by the Educational Opportunity Program/Special Services Program which are state and federal agencies promoting equality of educational opportunity through assistance for the academically disadvantaged. EOP actively engages in minority recruiting. Since many of these students are disadvantaged, they frequently need to do remedial/developmental work. They are actively encouraged to take Math 150 and thus the ethnic breakdown of these classes are more heavily skewed toward minority representation than the regular university. Northern California is heavily settled by Native American groups and thinly settled by white and other minority groups so Native Americans are well represented among class participants. The comparison with the general university population can be observed from the following graph:



Therefore, the typical Math 150 student is likely to be a white female between the ages of 20 and 24. She is, however, more likely to be a minority student than the general university student.

WHY ARE THEY TAKING A BASIC ALGEBRA COURSE IN COLLEGE?

Aside from the very obvious answer for the HSU students who need to qualify for additional math, the other possibilities are numerous. The deeper question is why these people need to take a course of this nature. We can divide the reasons students gave themselves into the categories of background, attitudes toward the subject, experience, self-judgement, language and learning disability. The results given here are based on a survey of 14 students in a Math 150X class.

Background. One of the first defenses a student puts up to explain his/her presence in a remedial/developmental course is that it has been a long time since they have taken a math course. Given the median age of the student at 21, it has probably been about 5 years since the last formal math training, yet old and young make the claim alike; 77% of the students responded positively to this statement.

Following closely is the statement that they have a poor background in math. Based on responses, the typical student has completed 1.8 courses in

high school but only .2 courses above Algebra I. Most of the courses were Algebra I (8); Basic Math (6); Business Math (5); General Math (3); Geometry (2) and Algebra II (1). The perception of a weak background seems reasonably accurate in terms of high school coursework. In addition, however, six students (43%) reported taking at least one course in college. This course was possibly a repeat class for some students since 5 responded that they had enrolled in Math 150 before.

Guessing at a reason for the lack of math coursework, it was interesting to note that only 31% did not expect to go to college when they were in high school. Fifteen percent felt they did not need math for what they wanted to do which is reasonable in view of the fact they were taking a math course.

Attitudes Toward Math. The students surveyed had been enrolled in Math 150X for 5 weeks so they were not as negative toward the subject as they might have been. It is interesting to note that the attitudes expressed were reasonably positive: 38% said they disliked math; 31% found math boring, and only 15% felt math did not make sense.

Experience with the Subject. Again coming to concrete experiences, 64% reported always having trouble with the subject. Five were repeating Math 150X, six (43%) had failed at least one course before, and only five had ever received an "A" in a math course before. Teachers, too, exerted a negative influence on some students with 54% reporting that a teacher "turned them off" to the subject.

Self-Judgement. The question arises then whether the students perceive some personal lack or problem to account for their lack of success. Fifty-four percent judged themselves not good in math while 38% felt they lacked

the aptitude. Two students had taken a math confidence course to improve their response to math courses and alleviate anxiety.

Language. Some of the Math 150 students were foreign students for whom English is a second language. For the most part these students had little difficulty with the concepts and needed the course primarily to develop the English vocabulary.

Learning Disabilities. The last category is that of the learning disabled student who, while functioning in most other classes, has extreme difficulty in learning and retaining the concepts presented. These are not the people who do not work at learning nor those for whom one repeat of the course is sufficient to get them through. Fortunately, such people are rare. I have encountered perhaps two students in the study group who truly have severe problems learning mathematics.

In order of student perceived importance we have an agreement proportion of

77%	It has been a long time since I took a math course.	BACKGROUND
71%	I have a poor background in math.	
31%	I did not think I was going to college.	
64%	Always had trouble with the subject.	EXPERIENCES WITH SUBJECT
54%	A math teacher really turned me off.	
54%	Not good in math.	SELF-JUDGEMENT
38%	Lack aptitude for math.	
38%	Dislike math.	ATTITUDES TOWARDS MATH
31%	Math is boring	
15%	Math does not make sense.	

Is the cart being put before the horse? Is math aversion in college caused more by background and experience or does the aversion lead to the background? The effect of the teacher and the perception about the length of time away from the subject leads me to support the former position more than the latter. These are highly motivated adult students and, for the most part, they do well.

HOW SUCCESSFUL ARE THEY?

The dropout rate in the Math 150 classes is about 18%. The course grades given are tabulated below.

Class	CR	NC	A	B	C	D	F	n
I	7	0	11	4	2	0	0	24
II	4	2	8	10	3	0	0	27
III	4	6	5	9	6	1	0	31
IV	8	3	4	3	0	0	0	18
V	4	0	7	6	3	1	0	21
VI_X	7	4	7	5	0	1	0	24
VI_Y	3	0	3	2	1	0	0	23
VII_X	4	3	5	4	3	4	0	23
	41 23%	18 10%	50 28%	43 24%	18 10%	7 4%	0 0%	177

Between the withdrawals and failures 80% of the students successfully completed Math 150. Over 50% received a grade of "B" or better. Apart from being good psychologically at this level, many students are brushing up on "rusty skills" and "catch on quickly," meriting high grades.

In a follow-up study completed in 1979 ninety students who took Math 150 were followed to see their subsequent performance. Of the 26 student who had taken additional coursework 19 (73%) successfully completed their courses which compares reasonably with the success rate of passing Math 150.

The course does indeed help students go on as it was intended to do.

WHAT IS TAUGHT ELSEWHERE?

In Florida at a state supported university there were no remedial/developmental classes. A student took a math placement examination and was placed into the intermediate algebra/trigonometry sequence or the year-long liberal arts math class. Students who took the liberal arts sequence rarely go on. The course as taught is an introduction to many mathematical concepts rather than basic algebra. As far as depth and rigor are concerned, it is a far easier course than Math 150; however, a far wider range of subjects are covered than the California students may even hear of. The intent is quite different since the sequence is not intended to lead to subsequent math courses.

The midwest university was similar to California in that there was a one quarter basic algebra class befcre a student went on. It was taught in the school itself mainly by graduate students, but it included many more advanced topics such as solving quadratic inequalities, systems of linear equations beyond 2. The intent of the course was to prepare a student for baby calculus or business calculus and was, in fact, called pre-calculus. The entering student seemed better prepared mathematically, but the vast majority were not from academically disadvantaged groups.

Each institution then has designed its coursework to reflect the preparation of the students and meet their mathematical ideas. The more selective the institution, the higher the level of developmental work. With universal education pushing into the college arena and the need to grow and expand through attracting non-traditional students, we face the challenge of dealing with non-traditional backgrounds.